

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 3, 2016/2017

**BEM1034 –MATHEMATICS FOR ECONOMICS**

( All sections / Groups )

26 MAY 2017  
9.00 a.m – 11.00 a.m  
( 2 Hours )

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### INSTRUCTIONS TO STUDENT

1. This Question paper consists of 4 pages including cover page with 4 Questions only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.

**Question 1 (25 marks)**(a) Find the value of  $x$  for the given equation

$$4^{3-x} = \frac{1}{16}$$

[4 marks]

(b) Compute

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \left\{ \begin{bmatrix} 2 & 0 & 1 \\ 1 & 0 & -2 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 2 & 1 \\ 3 & 0 \end{bmatrix} \right\}$$

[8 marks]

(c) An economic consists of three sectors finance (F), milling (M), and transportation (T) with the *Leontief matrix*

$$A = \begin{bmatrix} \frac{1}{18} & \frac{3}{16} & \frac{1}{15} \\ \frac{1}{9} & \frac{1}{4} & \frac{1}{3} \\ \frac{1}{9} & \frac{3}{16} & \frac{1}{6} \end{bmatrix}$$

Determine the production levels needed to satisfy an external demand for 40 units of F, 30 units of M, and no units of T.

(Useful information:  $X = (I - A)^{-1}D$ )

[13 marks]

**Question 2 (25 marks)**(a) Find the limit

$$\lim_{x \rightarrow \infty} \frac{x^2 + 1}{2x^2}$$

[4 marks]

(b) Determine whether the given function is continuous at the given points:

$$f(x) = \begin{cases} x + 2 & \text{if } x \geq 2 \\ x^2 & \text{if } x < 2 \end{cases} \quad x = 0, 2$$

[8 marks]

Continued...

(c) A total-cost function is given by

$$c = 25 \ln(q + 1) + 12$$

Find the **marginal cost** when  $q = 6$ .

[5 marks]

(d) Find the **marginal-revenue** function if the demand function is

$$p = \frac{25}{\ln(q + 2)}$$

Hint: revenue,  $r = pq$ .

[8 marks]

### Question 3 (25 marks)

(a) Suppose total revenue  $r$  and price per unit  $p$  are differentiable functions of output  $q$ . Use **integration by parts** to show that

$$\int p \, dq = r - \int q \frac{dp}{dq} \, dq$$

[6 marks]

(b) The demand equation for a product is

$$q = 400 - p^2$$

and the supply equation is

$$p = \frac{q}{60} + 5.$$

Find **producers' surplus** and **consumers' surplus** under market equilibrium.

[12 marks]

(c) Suppose a production function is given by

$$P = \frac{kl}{3k + 5l}$$

i. Determine the **marginal productivity functions**,  $\frac{\partial P}{\partial k}$  and  $\frac{\partial P}{\partial l}$ .  
ii. Show that when  $k = l$ , the marginal productivities sum to  $1/8$ .

[7 marks]

Continued...

**Question 4 (12 marks)**

(a) Determine whether the given function is a solution to the given differential equation:

$$y = e^{2x} - 3e^{-x}, \quad \frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$$

[10 Marks]

(b) Solve the **separable** equation

$$\frac{dy}{dx} = 4xy$$

[5 marks]

(c) Solve the **linear** equation

$$\frac{dy}{dx} = 2\frac{y}{x} + x^2e^x$$

[10 marks]

**End of Page**